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ABSTRACT

The revised Spache Readability Formula and the Fry Readability Formula were applied to 20 selected reading materials designed for adolescents reading at second grade level. Three samples from each text were examined. The results using the Spache formula corresponded to the publisher's stated readability levels, with no significant variability within books. But the results from the Fry formula were inconsistent with publisher's stated readability levels, and there was intrabook variability. (RL)

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READABILITY LEVELS OF SECOND GRADE HI-LO READING MATERIALS

by

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Introduction:

According to Harris and Jacobsen (1978), Herbert Spencer anticipated the significance of readability factors as far back as 1852. Spencer was concerned about syntactic and semantic features. He suggested four variables which are presently included in devising readability formulas: syllable length, word familiarity, word abstractions, and sentence length.

Since the 1920's researchers have concerned themselves with readability. They have considered typography, interests, and comprehensibility as the bases for judging books readable. Typographical studies helped bring about the introduction of print which allows the reader to peruse with speed and ease. The research on interests helped determine what topics people of different ages prefer. Comprehensibility was found by researchers to be when a certain group of people found a book readable.

The readability formulas grew out of this concept of comprehensibility. They are mathematical formulas which approximate the reading level of the materials they test. Although they do not take into consideration all aspects of reading, the readability formulas do enable teachers to test many varied books, magazines, etc. and subsequently place a student in the appropriate material.

Significance:

Knowledge of readability levels is especially important when working with a remedial student. The remedial student needs to experience feelings of success with his reading. He has suffered many failures in reading which often results in a poor self-concept and possible social maladjustment. Bond and Tinker (1973) have noted that "A wise teacher will start the child in a remedial program that is somewhat easy for him so that his successful performance will be immediately apparent." Flora J. Arnstein (1962) believes these successes are necessary to build confidence; and once confidence is achieved a remedial program can proceed smoothly with expected accomplishments. In order to place the student in materials which guarantee these successes, the teacher must know the readability levels of the reading materials.

In addition to improving a student's self-concept with successful reading experiences utilizing easy materials, Harris (1979) reports that Louis J. Cooper did a study in 1952 which showed that students made more significant gains when the material they read was easy.

The plight of the adolescent remedial reader is of significant concern because there are fewer materials available of interest to him at his reading level. More publishers are coming out with high interest-low level

reading materials, but there is still a dearth of materials on the primary level. The teacher must know if these books have been accurately assessed so that she may use them with confidence.

Hypothesis:

A study was conducted to determine if remedial reading materials for adolescents on the second grade level have the readability they profess to have or are they as inaccurate as the readability findings of Eberwein (1979) and Horn (1978) who showed that inaccuracies existed both across levels and within single books. It was hypothesized that remedial reading materials for adolescents on the second grade level do have the readability they profess to have.

Definitions:

Readability level: An approximation of the grade level of reading material at which it could be comprehended.

Hi-lo reading materials: Materials which are of high interest to students, but of a lower reading level than their actual grade placement.

Assumptions:

The Spache and Fry Readability Formulas closely approximate the grade levels at which reading tests place

students.

Limitations:

Readability formulas do not take all factors into consideration when establishing a method to estimate reading grade levels of materials. Interests, abstract concepts, semantic variations in words, etc. are not incorporated.

Procedure:

Using the revised Spache and the Fry Readability Formulas, twenty pieces of remedial reading materials labeled as second grade level were tested. Three samples of approximately one hundred words each were taken from each book or magazine and evaluated with both readability formulas. The samples were taken from the beginning, middle, and end of the books. To satisfy the purpose of this study, the results were compared to each other and to the publishers' stated levels.

Findings:

Table One indicates the materials studied, their publishers and the levels as stated by the publishers.

Table Two illustrates the readability levels of the three passages of each selection and the average readability level using the revised Spache Formula. As can be seen, all twenty of the hi-lo reading materials selected come within a

Table I

Publishers Stated Levels of Remedial Materials

	Reading Selection	Publisher	Grade Level
1.	Play It Again	Allyn & Bacon	2
2.	From the Top	Allyn & Bacon	2
3.	The 'Vette	Xerox Educational Publications	1.5-2.5
4.	The Monster Fly	Xerox Educational Publications	1.5-2.5
5.	Sports Action	Xerox Educational Publications	2.5-3.5
6.	Amazing Adventures	Xerox Educational Publications	2.5-3.5
7.	Silvabamba	Fearon-Pitman Publishers, Inc.	(S) 2.2 (F) 2.6
8.	Diamonds in the Dirt	Fearon-Pitman Publishers, Inc.	(S) 2.1 (F) 2.6
9.	The Jinx Boat	The Economy Co.	2
10.	New Practice Readers A	Webster McGraw-Hill	2
11.	Reading for Concepts B	Webster McGraw-Hill	2
12.	The Man Who Stopped Time	Jamestown Publishers	2
13.	The Ghost of the Dutchman	Scholastic Book Services	2
14.	A Quilt for Bermuda	Scholastic Book Services	2
15.	Action	Scholastic Magazines, Inc.	2
16.	America's Story Book 2	Steck-Vaughn Company	2
17.	The Champion's Jacket	Bowmar/Noble Publishers	2
18.	I Can Read About the Octopus	Troll Associates	2 - 4
19.	Point 31 Magazine Vol. 1 No. 1	Reader's Digest Educational Division	1.5-2.9
20.	Getting the Facts B	Barnell Loft	2

Table II

Readability Levels Using the Revised Spache Formula

Reading Selection	First	Second	Third	Average
1. [illegible] It Again	2.4	3.1	3.0	2.8
2. From the Top	2.7	2.2	2.3	2.4
3. The 'Vette	1.9	2.1	1.9	1.9
4. The Monster Fly	1.9	1.5	1.9	1.8
5. Sports Action	2.9	2.3	2.4	2.5
6. Amazing Adventures	1.8	2.4	2.4	2.2
7. Silvabamba	2.4	1.7	1.9	2.0
8. Diamonds in the Dirt	2.4	2.4	1.9	2.2
9. The Jinx Boat	2.2	2.5	2.7	2.5
10. New Practice Readers A	1.9	2.0	1.9	1.9
11. Reading for Concepts B	1.8	2.2	1.7	1.9
12. The Man Who Stopped Time	1.7	1.6	2.6	2.0
13. The Ghost of the Dutchman	2.3	2.3	2.1	2.2
14. A Quilt for Bermuda	1.8	2.1	2.2	2.1
15. Action	3.1	2.9	2.1	2.7
16. America's Story Book 2	2.2	2.3	2.8	2.4
17. The Champion's Jacket	1.7	2.0	2.1	1.9
18. I Can Read About the Octopus	2.9	3.1	3.2	3.1
19. Point 31 Magazine Vol. 1 No. 1	2.1	2.8	2.5	2.5
20. Getting the Facts B	2.8	2.2	2.1	2.4

six months range of the publishers' stated levels. There are five selections whose averages fall one to three months below the publishers' stated levels; these differences are of no significance. None of the averaged samples is above the stated levels. Within the three individual reading selections chosen from each book, or within the sixty passages, there are again no deviations outside the six months range. The average number of sentences in these selections was 11.9. The range for the number of sentences was from 7 to 22. The average number of words for the sixty selections was 105. The number of words in all the selections ranged from 100 to 114. The average number of words outside Spache's Revised Word List was 6.45. The range of words outside Spache's Revised Word List was 2 to 16.

Table Three illustrates the readability levels of the same three passages of each selection and the average readability level when the extended Fry Readability Graph Formula is used and the results indicate that nine of the twenty selections are one to four years higher than the levels stated by the publishers. None of the selections is lower than the grade levels as specified by the publishers. The grades ranged from second to sixth grade. Within the three individual reading selections from the chosen books, or within the sixty passages, the grades

Table III

Readability Levels Using the Fry Formula

Reading Selection	First	Second	Third	Average
1. Play It Again	6	3	4	4
2. From the Top	3	2	3	3
3. The 'Vette	1	4	2	2
4. The Monster Fly	2	1	4	2
5. Sports Adventures	5	3	1	2
6. Amazing Adventures	2	3	7	4
7. Silvabamba	2	2	2	2
8. Diamonds in the Dirt	3	3	1	3
9. The Jinx Boat	2	3	5	3
10. New Practice Readers A	2	2	1	2
11. Reading for Concepts B	2	3	2	2
12. The Man Who Stopped Time	1	2	4	2
13. The Ghost of the Dutchman	2	3	2	2
14. A Quilt for Bermuda	2	4	3	3
15. Action	5	4	5	5
16. America's Story Book 2	4	6	9	6
17. The Champion's Jacket	1	3	1	2
18. I Can Read About the Octopus	6	4	7	6
19. Point 31 Magazine Vol. 1 No. 1	1	2	3	2
20. Getting the Facts B	3	2	1	2

Table IV

Readability Levels of the Materials Compared

Reading Selection		Publisher	Spache	Fry
1.	Play It Again	2	2.8	4
2.	From the Top	2	2.4	3
3.	The 'Vette	1.5-2.5	1.9	2
4.	The Monster Fly	1.5-2.5	1.8	2
5.	Sports Action	2.5-3.5	2.5	2
6.	Amazing Adventures	2.5-3.5	2.2	4
7.	Silvabamba	(S)2.2 (F)2.6	2.0	2
8.	Diamonds in the Dirt	(S)2.1 (F)2.6	2.2	3
9.	The Jinx Boat	2	2.5	3
10.	New Practice Readers A	2	1.9	2
11.	Reading for Concepts B	2	1.9	2
12.	The Man Who Stopped Time	2	2.0	2
13.	The Ghost of the Dutchman	2	2.2	2
14.	A Quilt for Bermuda	2	2.1	3
15.	Action	2	2.7	5
16.	America's Story Book 2	2	2.4	6
17.	The Champion's Jacket	2	1.9	2
18.	I Can Read About the Octopus	2-4	3.1	6
19.	Point 31 Magazine Vol. 1 No. 1	1.5-2.9	2.5	2
20.	Getting the Facts B	2	2.4	2

ranged from first to ninth. The average number of sentences was 11.5. The number of sentences per selection ranged from 6.8 to 21.2. The average number of syllables per selection was 125.8 and the range for the sixty passages was 105 to 159.

Table IV compares the publishers' stated levels with the averaged readability levels obtained from utilizing the Spache and Fry Formulas. Some results of these comparisons are worth commenting on. The first selection from Play It Again is calculated at a 2.4 grade level according to the Spache formula but at a sixth grade level on the Fry. The third selection of Amazing Adventures is 2.4 on the Spache and seventh on the Fry. On the third selection of Action the Spache formula produces a 2.1 grade level and the Fry formula gives a fifth grade level. The passage which exhibits the greatest differences throughout is America's Story Book 2. With the Spache formula all three selections are on a second grade level; but with the Fry Graph the selections are fourth, sixth, and ninth grades respectively. I Can Read About the Octopus is also as much as four grades apart on the two different formulas.

Conclusions:

When employing the Spache Readability Formula, the hypothesis, that remedial reading materials for adolescents

on the second grade level do have the readability the publishers profess they have, is confirmed. In all instances the books fall within a six months range of the publishers' stated levels. Moreover, when utilizing the Spache Formula, data is provided which contradicts Horn's and Eberwein's findings concerning intrabook inconsistencies. The average range for these books is .52 grade levels. They vary from .1 grade levels to 1.0. Horn and Eberwein also pointed out, however, that books did not generally get progressively more difficult from beginning to end. This could be said to hold true here since only five selections progress from a lower to a higher level; however, since the average range is .52 levels that conclusion is insignificant.

The same results do not hold true when using the Fry Readability Graph because nine of the twenty books are one to four years higher than the publishers' stated grade levels, thus the hypothesis is rejected. Horn's and Eberwein's findings are confirmed in both areas. The average range for these books is 2.35 grade levels. This is significant when you are working with second grade materials. The range varies from 0 to 5 grade levels. In six instances only, the reading material progresses from easy to more difficult. The other fourteen selections jump back and forth in their readability levels.

These findings seem to indicate a need for further

research in the correlation of the Fry Readability Graph and the Spache Readability Formula since the results are so inconsistent. It would appear that publishers might be currently using the Spache formula in determining the readability of their materials since the results are so consistent with their reported readability levels. Conversely, it could be said that publishers are not using the Fry formula since it appears to produce results often markedly different from other formulas. It is difficult to accept the publishers designations of difficulty when two formulas normally having a high correlation produce such inconsistent results. However, it must be noted again that readability formulas are not perfect predictions of the comprehensibility of a book. They do not take into account the reader's interests and background, the concepts within the material, multiple word meanings, etc. They are guidelines for teachers in helping to choose a book which will ensure success for a reader, thereby, building self-confidence so that he may stride forward with pleasure and understanding to other reading materials.

George R. Klare (1963) lists Bertha A. Lively and S. L. Pressey's Readability Formula, published in 1923, as one of the earliest formulas and one that others later used as a model. Lively and Pressey's procedure was to sample 1000 words from a book to determine the vocabulary difficulty. Words were assigned an index of difficulty taken from the frequency of each word as given in Thorndike's Teacher's Word Book. They ranged from ten to one, ten being the most frequently used. They then counted the number of words not in Thorndike's 10,000 most common words. These were "zero-value words." Lively and Pressey took the median of the index numbers of the words and counted the zero-value words twice. This resulted in a "weighted median index number." Thus high median index numbers meant easy vocabularies. It would take about three hours to apply the procedure to a book. It was used for second grade through college.

The Lorge Formula, in 1939, was the beginning of the easy-to-use readability formulas. Lorge (1949) felt that the measure of vocabulary load was the most reliable index of readability. Lorge's formula, as written by Klare (1963), is $X_1 = .07X_2 + .130X_3 + .1031X_4 + 1.6126$. X_1 equals the grade placement; X_2 is the average sentence length in words; X_3 is the number of prepositional phrases per 100 words; and X_4 equals the number of different hard words per 100 words not on the Dale 769 word list. The grade-placement value in

this formula is the average reading ability necessary to correctly answer three-fourths of the questions on a test passage. This test is used for grades three to twelve. Lorge hastens to point out that readability formulas do not take into account vividness of imagery, a reader's motivation, a reader's interests, author's style, etc.

Rudolf Flesch (1948) brought the concept of readability formulas to the public, according to Klare. He wrote books and articles which set forth his views and made something well-known only to the educational world, well-known to all fields. Flesch added the factor of abstract words to his readability formula. His formula selected three to five samples of 100 words. He determined the average sentence length (X_s) in words; and counted the affixes (X_m) and number of personal references (X_n) and applied these to the formula: $.1338X_s + .0645X_m - .0659X_n - .7502$. Materials tested would lie between one, the easiest, and seven, the most difficult. Flesch modified this formula with two additional formulas. Formula A was labelled "Reading Ease" and applied the number of syllables per 100 words (wl) and the average number of words per sentence (sl) to the equation: R.E. = 206.835 − .846wl − 1.015sl. This new form was much easier and people in many fields could use it. The second formula was for "Human Interest." It had a low prediction value. The main point of interest in Formula B is that

human interest will make the reader attend more to the material. Flesch was trying to overcome the customary lack of an interest factor in readability formulas.

Edgar Dale and Jeanne Chall (1948) reviewed both the Lorge and Flesch readability formulas and found them inadequate. They felt a larger word list than the Dale 769 word list was necessary; and a shorter formula could be devised. They, too, selected 100 word samples. They computed the average sentence length in words (X_2) and the percentage of words outside the Dale list of 3000 words (X_1) and applied them to this formula: $X_{c_{50}} = .1579X_1 + .0496X_2 + 3.6365$. $X_{c_{50}}$ is the reading-grade score of a pupil who could correctly answer one-half the test questions on a passage. Klare stated that there was evidence that this formula was "somewhat more highly predictive than any of the other popular formulas available. . ." Dale and Chall tested this formula on health-education materials and passages from current-events magazines, newspapers, etc. and found their predictions correlated highly with judgments of readability experts and expert teachers in social studies.

George Spache (1953) created a new formula to evaluate primary grade reading materials. He felt there was a need in this area since the preceeding formulas were mainly for adult materials. Spache also used average sentence length in words (X_1) and the number of words outside the Dale Easy

Word List of 769 (X_2) from samples of 100 words. His formula was Grade Level = $.141X_1 + .086X_2 + .839$. Clarence Stone revised the Dale List vocabulary component of the readability formula in 1957. Since then, Spache (1972) has also revised the list to include 1,041 words which "reflect current developments in primary instructional and recreational materials." The new formula is G.L. = $.121X_1 + .082X_2 + .659$. Spache states the formula is applicable only to primary reading materials below 3.9. The formula gives the grade level to a tenth of a grade.

In 1968 Edward Fry came out with a readability graph to save time. Three passages of exactly 100 words were used. The number of sentences and the number of syllables were counted and averaged and then plotted on the graph to predict approximate grade level. The graph was later extended to include the primary grade materials. Fry (1969) states that the curve on his graph makes allowances "so that in the lower levels sentence length plays a major role in readability while, at the upper levels, word length accounts for most of the variability." Fry found that when he extended his graph to the primary grades it had a correlation of .90 with the Spache Formula.

Another method for determining readability, as described by Klare (1974), is the cloze procedure used by Bormuth in 1969. Bormuth's analyses are just mentioned here to make

the reader aware of Bormuth's studies. He developed twenty-four readability formulas after extensive research. Many of them are detailed and complex. His materials covered a wide range of subject matter and ranged in difficulty from first grade to college.

Many studies have been done concerning the varied aspects of readability and readability formulas. David Pearson (1974) conducted a study "to provide an assessment of linguistic variables which might conceivably affect the way in which children comprehend verbal data when they read." He tested the responses of sixty-four third and fourth grade children. Pearson's research indicates that sentence length and complexity should not be of such concern in the middle grades. Pearson has shown that comprehension difficulty is not necessarily decreased by reducing sentence length. In some instances he has shown that longer and more subordinated sentence forms produce better comprehension and that children seem to prefer the complex sentences. These findings certainly indicate the need for further research.

John Miller and Frances W. Marshall (1978) conducted a study to determine if people who had more reading-teaching training and more experience in teaching reading could make more accurate judgments about the readability levels of materials than people with limited training and experience. Six passages were selected representing grades one to six.

Three groups of subjects studied the passages. Group I consisted of undergraduate students with no training in elementary education and teaching experience. Group II was made up of certified elementary school teachers who had had one three hour reading methods course and one to three years of teaching experience. Group III consisted of certified elementary school teachers with one three hour reading methods course and four or more years of teaching experience. Group IV was elementary reading specialists who had had twelve or more graduate hours of reading training and at least two years of classroom experience. Group I was the most accurate in judging and Group III was the least accurate. Miller and Marshall concluded "that teachers may have a great deal of difficulty making the critical match between students and reading materials due to a lack of ability to estimate the difficulty level of materials." Since much of the students' reading isn't done in leveled texts this is certainly a dilemma. Miller and Marshall suggest inadequate teacher training as the source of the problem. They make the suggestion that:

> teachers need to become familiar with factors which <u>influence</u> difficulty rather than with formulae that estimate difficulty. Learning to recognize differences in vocabulary, sentence structure, idea density, and author style, would seem to facilitate this judgmental ability.

The study described by Lowell D. Eberwein (1979) using

the Harrison Jacobsen Formula, found that the basal readers he tested had an average range of 4.56 grade levels. At the pre-primer level the range was 2.1 levels and in the fourth to sixth grade text books the range was 7.6 levels. He also noted that when books were divided into thirds, they did not generally get progressively more difficult from beginning to end. Eberwein also questioned the teachers using these materials and found they were unaware of these aspects of the texts. This varied intrabook readability factor was a surprise to the teachers he questioned. They were unaware that texts would have a lack of progression from easy to difficult.

Joan M. Horn (1978) did a study similar to Eberwein's. She tested two mathematical and two basal reading textbook series using the Fry Readability Graph with the Kretschmer Correction Formula. Five samples were taken from each text. Horn found that the basal texts tested covered many years within one grade unit. Her research also corroborated Eberwein's findings that some textbooks do not progress from easy material to the more difficult. The readability of a text often varies erratically within a text. Horn concludes that "no textbook should be accepted according to its general readability average." The teacher should know the diversity within texts.

Lynnda Williams (1979) tested Fry's Readability

Principle that states high motivation can overcome high readability, but low motivation necessitates a low readability of materials. She states that "Purpose and meaning would seem most effective in stimulating reading if they arise from the student himself." To test this theory Williams asked fifty-eight high school students returning books to the library to answer a short interest inventory for her, if they had read the book for pleasure and not as a school assignment. They were also asked to state how many pages they had read in the book. After the interview they were tested with the California Comprehensive Tests of Basic Skills for reading comprehension. A readability score was also calculated for the returned books using the Fry Reaoability Formula and five selections of 100 words each. Readability varied from 3.0 to 13.0 on a total of seventy-five books. The reading levels of the students varied 3.3 to 13.6. The study found that children read more of the books which interested them. It also showed no correlation between reading levels of students and the readability of those self-selected books. Books were not chosen on the basis of reading difficulty but for interest. The students who read books which did not match their ability were generally reading books 2.3 grades higher than their mean reading level of 5.6. Williams' research confirmed Fry's Principle.

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